

# Schools Pool Actuarial Valuation

*As of June 30, 2017*



**Required Contributions for Fiscal Year**  
July 1, 2018 through June 30, 2019





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# Actuarial Certification



September 2018

To the best of our knowledge, this report is complete and accurate and contains sufficient information to fully and fairly disclose the funded condition of the Schools Pool. This valuation is based on the member and financial data as of June 30, 2017 provided by the various CalPERS databases and the benefits under this plan with CalPERS as of the date this report was produced. In our opinion, this valuation has been performed in accordance with generally accepted actuarial principles and in accordance with standards of practice prescribed by the Actuarial Standards Board. The assumptions and methods are internally consistent and reasonable for this plan, as prescribed by the CalPERS Board of Administration according to provisions set forth in the California Public Employees' Retirement Law.

The undersigned are actuaries for CalPERS, who are members of the American Academy of Actuaries and the Society of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

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# Highlights and Executive Summary

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# Highlights and Executive Summary

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## Introduction

The Schools Pool provides retirement benefits to members employed by school districts and community college districts in California. It generally does not cover teachers as they are covered by a separate retirement system - the California State Teachers' Retirement System, also known as CalSTRS.

This actuarial valuation determines the funded status as of June 30, 2017 and sets forth the schools employer and employee contribution rates for the plan for fiscal year July 1, 2018 through June 30, 2019.

## Purpose of Report

This actuarial valuation was performed by the CalPERS Actuarial Office using data as of June 30, 2017. The purpose of the report is to:

- Set forth the assets and accrued liabilities of the Schools Pool as of June 30, 2017.
- Determine the required employer contribution rate for Fiscal Year July 1, 2018 through June 30, 2019.
- Determine the required employee contribution rate for Fiscal Year July 1, 2018 through June 30, 2019 for school employees subject to the Public Employees' Pension Reform Act of 2013 (PEPRA).
- Provide actuarial information as of June 30, 2017 to the CalPERS Board of Administration and other interested parties.

The pension funding information presented in this report should not be used in financial reports subject to Governmental Accounting Standards Board (GASB) Statement Number 68 for a Cost-Sharing Multiple-Employer Defined Benefit Pension Plan.

The use of this report for any other purposes may be inappropriate.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; changes in actuarial policies; and changes in plan provisions or applicable law.

## California Actuarial Advisory Panel Recommendations

This report includes all the basic disclosure elements as described in the Model Disclosure Elements for Actuarial Valuation Reports recommended in 2011 by the California Actuarial Advisory Panel (CAAP), with the exception of including the original base amounts of the various components of the unfunded liability in the "Schedule of Amortization Bases."

Additionally, this report includes the following "Enhanced Risk Disclosures" also recommended by the CAAP in the Model Disclosure Elements document:

- A "Deterministic Stress Test," projecting future results under different investment income scenarios
- A "Sensitivity Analysis," showing the impact on current valuation results using alternative discount rates of 6.0 percent, 7.0 percent and 8.0 percent.

# Highlights and Executive Summary

## Required Contribution Rates

### Required Employer Contribution Rates

The actuarially required employer contribution rate for fiscal year July 1, 2018 through June 30, 2019 is shown in the table below. For comparison purposes, the corresponding contribution rate for fiscal year July 1, 2017 through June 30, 2018 is also provided. The expected contribution amounts are also shown in the table.

	Fiscal Year 2017-18	Fiscal Year 2018-19
1) Contribution as a Percentage of Payroll		
a) Total Normal Cost	14.896%	15.739%
b) Employee Contribution <sup>1</sup>	6.793%	7.000%
c) Employer Normal Cost [(1a) – (1b)]	8.103%	8.739%
d) Unfunded Rate	7.428%	9.323%
<b>e) Required Employer Rate [(1c) + (1d)]</b>	<b>15.531%</b>	<b>18.062%</b>
Projected Annual Payroll for Contribution Year	\$13,021,669,245	\$13,683,435,270
2) Contribution in Projected Dollars		
a) Total Normal Cost	\$1,939,707,851	\$2,153,635,877
b) Employee Contribution <sup>1</sup>	884,561,992	957,840,469
c) Employer Normal Cost [(2a) – (2b)]	1,055,145,859	1,195,795,408
d) Unfunded Contribution	967,270,839	1,275,750,831
<b>e) Required Employer Contribution [(2c) + (2d)]</b>	<b>\$2,022,416,698</b>	<b>\$2,471,546,239</b>

(1) For classic members, this is the percentage specified in the Public Employees Retirement Law, net of any reduction from the use of a modified formula or other factors. For PEPRA members the member contribution rate is based on 50 percent of the total normal cost. A development of PEPRA member contribution rates can be found in Appendix D.

Note that the payroll used to calculate the expected dollar contributions is the payroll used in the valuation incorporating two years of payroll growth using the payroll growth assumption of 3 percent. To the extent that payroll in the contribution year is different than the projected payroll, the actual contribution amounts will be different than the expected contributions shown in the table above.

Changes in the Unfunded Accrued Liability (UAL) due to actuarial gains or losses as well as changes in actuarial assumptions or methods are amortized using a 5-year ramp up. For more information, please see “Amortization of the Unfunded Actuarial Accrued Liability” under “Actuarial Methods” in Appendix A. This method phases in the impact of unanticipated changes in UAL over a 5-year period and attempts to minimize employer cost volatility from year to year. As a result of this methodology, dramatic changes in the required employer contributions in any one year are less likely. However, required contributions can change gradually and significantly over the next five years. In years where there is a large increase in UAL the relatively small amortization payments during the ramp up period could result in a funded ratio that is projected to decrease initially while the contribution impact of the increase in the UAL is phased in.

### Reasons for Change in Employer Contributions for the Schools Pool

Overall, the required contributions for the Schools Pool are expected to increase by \$449.1 million between fiscal year 2017-18 and fiscal year 2018-19. The increase is driven mostly by the lowering of the discount rate, by the continued phase-in of previous experience losses since 2014 and the change in actuarial assumptions in the 2015 annual valuation.

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2017 actuarial valuation for the Schools Pool. The employer contributions for fiscal year 2018-19 were calculated using a discount rate of 7.375 percent. The impact on the contributions is approximately \$88.1 million which accounts for the increase in normal cost and year one of the five-year phase-in of the increase in unfunded liability, to be paid over twenty years.

CalPERS currently employs an amortization and smoothing policy that spreads rate increases or decreases over a 5-year period.

# Highlights and Executive Summary

In this valuation, the impact of the assumption changes adopted in 2014 and implemented in the 2015 annual valuation and the impact of previous investment experience are still being phased into the contribution requirement. The 2014 assumption change will continue to increase contribution requirements for another two years.

The table below highlights all major contributors to the change in required contributions.

Reason for Change	Change in Required Contribution (Dollars in Millions)
Growth in overall payroll	\$53.6
First installment of the 5-year phase in for:	
Normal cost change plus 20-year amortization of lowering discount rate to 7.375 percent	88.1
30-year amortization of experience gain	(5.1)
Progression of previous ramped-in amortization bases for:	
Change in assumptions – 6/30/15 (3rd year)	92.6
Experience Loss – 6/30/16 (2nd year)	68.5
Experience Loss – 6/30/15 (3rd year)	56.6
Experience Loss – 6/30/14 (4th year)	59.3
Normal progression of existing non-ramped amortization bases	9.4
Demographics and Balance of Miscellaneous Items	26.0
<b>Total Change In Required Contributions</b>	<b>\$449.1</b>

## PEPRA Member Contribution Rates

With the enactment of PEPRA, new members hired on or after January 1, 2013 are subject to PEPRA and are required to contribute 50 percent of the total annual normal cost of their pension benefit as determined by the actuary. PEPRA school members currently contribute 6.50 percent of salary. The contribution rate for schools members not subject to PEPRA, i.e. classic members, is set by statute and is currently 7.00 percent of salary.

Current law contains a provision that requires a change in the PEPRA member contribution rate when the total normal cost changes by more than 1 percent of payroll. When a change is triggered, the member contribution rate is adjusted once again to half the normal cost, rounded to the nearest quarter of one percent. The current PEPRA member contribution rate of 6.50 percent is based on a total normal cost of 12.91 percent of payroll. The change of discount rate and plan demographics have increased the total normal cost for PEPRA members from 12.91 percent to 14.07 percent of payroll this year. The total normal cost for PEPRA members has now changed by more than one percent since the last time the member contribution rate was established. As a result, an adjustment to the PEPRA member contribution rate is necessary. The member contribution rate for the PEPRA members will be increased to 7.00 percent effective July 1, 2018. This is 0.50 percent higher than the current 6.50 percent.

Note that as of June 30, 2017, there are 105,565 active PEPRA members in the Schools Pool, which represents 33 percent of the total active population of the Schools Pool.

The table below shows the determination of the member contribution rate based on 50 percent of the Total Normal Cost on June 30, 2017.

Plan	Basis for Current Rate		Rates Effective July 1, 2018			
	Total Normal Cost <sup>1</sup>	Member Rate	Total Normal Cost <sup>2</sup>	Change	Change Needed	Member Rate
Schools	12.912%	6.50%	14.072%	1.160%	Yes	7.00%

(1) As of June 30, 2016 valuation date

(2) As of June 30, 2017 valuation date

# Highlights and Executive Summary

## Projected Future Contribution Rates

The CalPERS Board approved a lowering of the CalPERS discount rate assumption at the December 21, 2016 meeting. For the Schools Pool, the discount rate is lowered to 7.375 percent in the June 30, 2017 actuarial valuation for the first time, impacting the Schools Pool employer contribution rates beginning in fiscal year 2018-19. The discount rate will be lowered further to 7.25 percent and then to 7.00 percent over the next two valuations. The Board also adopted new demographic assumptions on December 19, 2017 that will be reflected in the June 30, 2018 valuation impacting employer contribution rates beginning in fiscal year 2019-20.

Lowering the discount rate means both the normal cost and the accrued liabilities will increase in the future. These increases will result in higher required employer contributions. Consistent with the existing board amortization and smoothing policy, the impact of each change in discount rate will be phased in over a five-year period. As a result, the full impact of the reduction in the discount rate will not be realized until fiscal year 2024-25.

The CalPERS Board also adopted a reduction of the inflation assumption which will be implemented in two steps in conjunction with the decreases in the discount rate. The long-term inflation rate will be lowered from 2.75 percent to 2.625 percent for the June 30, 2018 valuation and to 2.50 percent for the June 30, 2019 valuation. The reduction in the inflation assumption results in decreases in both the normal cost and the accrued liabilities in the future.

In addition to increases in the schools employer contribution rate, active PEPRAs members may also see their contribution rate rise in the future if the lowering of the discount rate results in another change in normal cost of more than 1 percent. At this time, it is estimated the normal cost will most likely not increase by more than 1 percent when the discount rate is lowered to 7.0 percent. The PEPRAs member contribution rate is expected to stay at 7.0 percent when the June 30, 2019 annual valuation is completed. This is only an estimate based on the current demographics of the active members. The PEPRAs normal cost will be reassessed each year in the future to determine whether a change is required.

The table below shows the projected employer contribution rates for the next six fiscal years. It also shows the classic member employee contribution rate and the estimated PEPRAs members employee contribution rate for the future. Projected results are based on the June 30, 2017 annual valuation for the Schools Pool, reflecting anticipated increases caused by the continued phase-in of the reduction in the discount rate assumption and all other assumption changes mentioned above. The projections assume CalPERS earns 8.6 percent for fiscal year 2017-18, 7.25 percent for fiscal year 2018-19, and 7.00 percent every fiscal year thereafter. The projections also assume that all other actuarial assumptions will be realized and no changes to assumptions, contributions, benefits or funding will occur during the projected period. The projections take into account the positive impact PEPRAs is expected to gradually have on the normal cost.

Valuation Date	Fiscal Year Impact	Discount Rate	Payroll Growth Assumption	Inflation Assumption	Projected Employer Contribution Rate (As Percentage of Payroll)	Classic Member Contribution Rate	Estimated PEPRAs Member Contribution Rate
6/30/2018	2019-20	7.25%	2.875%	2.625%	20.7%	7.00%	7.00%
6/30/2019	2020-21	7.00%	2.75%	2.50%	23.4%	7.00%	7.00%
6/30/2020	2021-22	7.00%	2.75%	2.50%	24.5%	7.00%	7.00%
6/30/2021	2022-23	7.00%	2.75%	2.50%	25.0%	7.00%	7.00%
6/30/2022	2023-24	7.00%	2.75%	2.50%	25.5%	7.00%	7.00%
6/30/2023	2024-25	7.00%	2.75%	2.50%	25.7%	7.00%	7.00%
6/30/2024	2025-26	7.00%	2.75%	2.50%	25.5%	7.00%	7.00%

For projected contributions under alternate investment return scenarios, please see the “Analysis of Future Investment Return Scenarios” in the “Risk Analysis” section.

# Highlights and Executive Summary

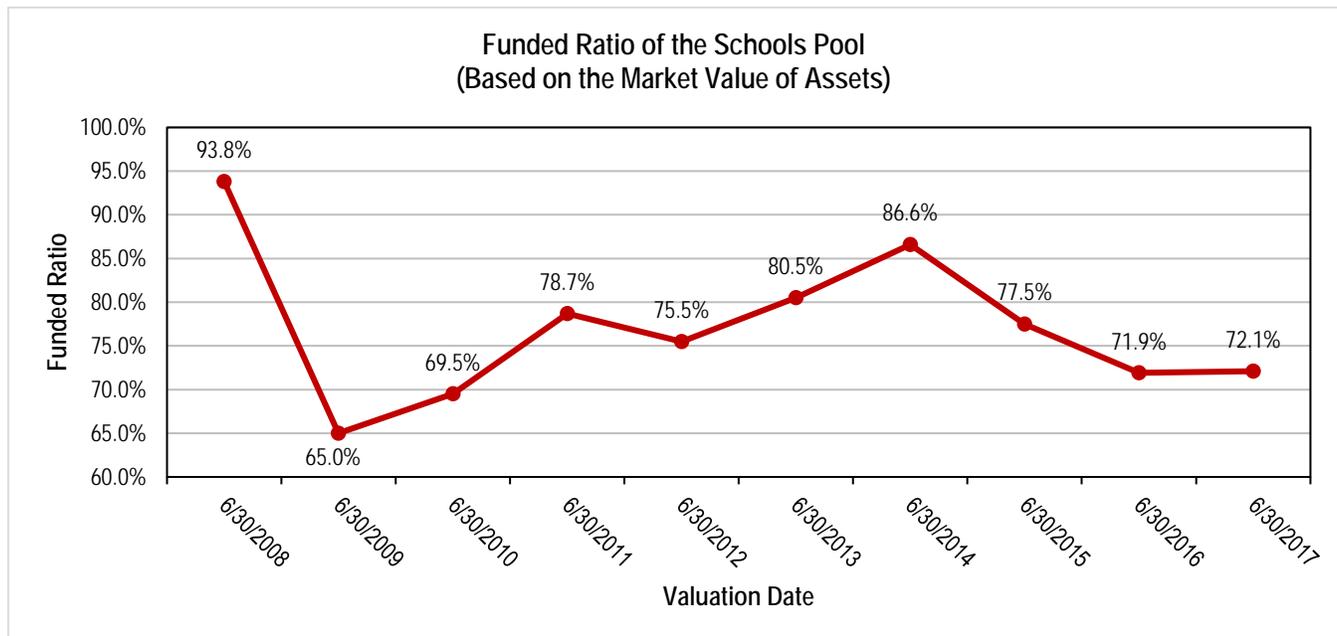
## Plan's Funded Status

The funded status of a pension plan is defined as the ratio of assets to a plan's accrued liabilities. Plans with a lower funded ratio are, all other things being equal, more at risk of not being able to meet their future benefit obligations. From July 1, 2016 to June 30, 2017 the funded status for the Schools Pool increased by 0.2 percent. This was mainly due to the investment return of 11.2 percent offset by the reduction in the discount rate.

The table below shows the development of the funded status of the plan using the market value of assets on June 30, 2017.

	June 30, 2016	June 30, 2017
1) Present Value of Projected Benefits	\$91,058,726,935	\$99,598,215,938
2) Entry Age Normal Accrued Liability	77,543,827,270	84,416,060,617
3) Market Value of Assets (MVA)	55,784,854,423	60,865,459,800
4) Unfunded Liability [(2) - (3)]	\$21,758,972,847	\$23,550,600,817
5) Funded Ratio [(3) / (2)]	71.9%	72.1%

The graph below shows the funded status of the Schools Pool for the past ten years based on the market value of assets.



## Changes Since the Prior Year's Valuation

### Actuarial Methods and Assumptions

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2017 actuarial valuation for the Schools Pool. The minimum employer contributions for fiscal year 2018-19 determined in this valuation were calculated using a discount rate of 7.375 percent. The projected employer contributions shown in this report are calculated assuming that the discount rate will be lowered to 7.25 percent as of June 30, 2018 and to 7.0 percent as of June 30, 2019 as adopted by the Board. The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate assumption provides a more realistic assumption for the long term investment return of the fund.

Notwithstanding the Board's decision to phase into a 7.0 percent discount rate, subsequent analysis of the expected investment return of CalPERS assets or changes to the investment allocation may result in a change to this discount rate schedule.

A complete description of the actuarial methods and assumptions used in the June 30, 2017 valuation may be found in Appendix A of this report.

### Plan Provisions

No changes were made since the prior valuation. Please refer to Appendix B for a summary of the plan provisions used in this valuation.

### Risk Mitigation

The CalPERS Board of Administration adopted a Risk Mitigation Policy which is designed to reduce funding risk over time. The policy establishes a mechanism whereby CalPERS investment performance that significantly outperforms the discount rate triggers adjustments to the discount rate, expected investment return and strategic asset allocation targets. A minimum excess investment return of 2 percent above the existing discount rate is necessary to cause a funding risk mitigation event. However, this policy was temporarily suspended. More details on the Risk Mitigation Policy can be found on our website.

## Subsequent Events

On December 19, 2017, the CalPERS Board of Administration adopted new actuarial assumptions based on the recommendations in the December 2017 CalPERS Experience Study and Review of Actuarial Assumptions. This study reviewed the retirement rates, termination rates, mortality rates, rates of salary increases and inflation assumption for Public Agencies. These new assumptions will be incorporated in the June 30, 2018 actuarial valuation and will impact the required contribution for FY 2019-20. In addition, the Board adopted a new asset allocation as part of its Asset Liability Management. The new asset mix supports a 7.00 percent discount rate.

On February 14, 2018, the CalPERS Board of Administration has also adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on UAL bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019. There is one exception to these rules for the Schools Pool valuation – the impact of the discount rate change from 7.25% to 7.0% in the June 30, 2019 valuation will be amortized under the old policy.

In the June 30, 2018 valuation, the CalPERS Actuarial Office will transition to a new actuarial valuation system. Actuarial results, such as normal cost and accrued liability, may be slightly higher or lower due to minor differences between the current system and the new system. We do not expect a significant change to the projected required contributions.

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## Assets

### Reconciliation of the Market Value of Assets

1) Market Value of Assets as of June 30, 2016 Including Receivables	\$55,784,854,424
2) Receivables for Service Buybacks as of June 30, 2016	95,806,080
3) Market Value of Assets as of June 30, 2016 [(1) - (2)]	\$55,689,048,344
4) Employer Contributions	1,783,736,428
5) Employee Contributions	897,590,231
6) Benefit Payments to Retirees and Beneficiaries	(3,650,553,965)
7) Refunds	(74,355,626)
8) Administrative Expense	(82,489,115)
9) Transfers and Miscellaneous Adjustments	15,624
10) Investment Return	6,206,964,790
11) Market Value of Assets as of June 30, 2017 Excluding Receivables [(3) + (4) + (5) + (6) + (7) + (8) + (9) + (10)]	\$60,769,956,711
12) Receivables for Service Buybacks as of June 30, 2017	\$95,503,089
13) Market Value of Assets as of June 30, 2017 Including Receivables [(11) + (12)]	\$60,865,459,800

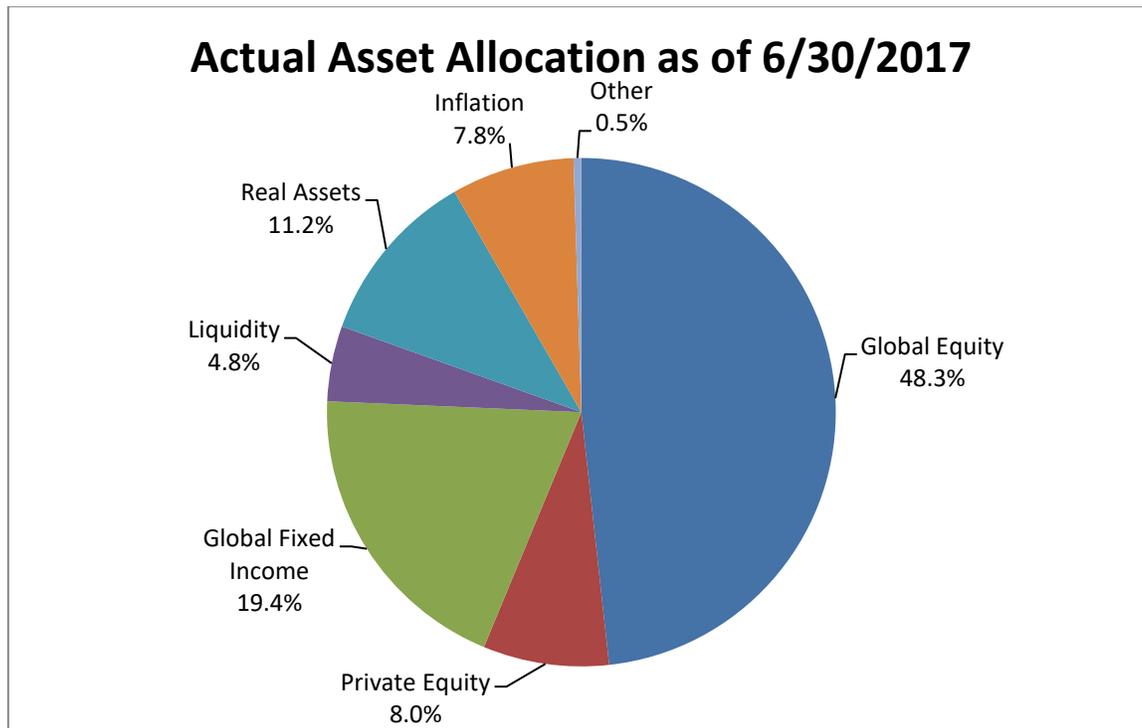
# Assets

## Asset Allocation

CalPERS adheres to an Asset Allocation Strategy which establishes asset class allocation policy targets and ranges, and manages those asset class allocations within their policy ranges. CalPERS Investment Beliefs No. 6 recognizes that strategic asset allocation is the dominant determinant of portfolio risk and return. On February 19, 2014, the CalPERS Board of Administration adopted changes to the current asset allocation as shown in the Policy Target Allocation below expressed as a percentage of total assets. The Board further changed the asset allocation on December 19, 2017 with changes effective July 1, 2018.

The asset allocation and market value of assets shown below reflect the values of the Public Employees Retirement Fund (PERF) in its entirety as of June 30, 2017. The assets of the Schools Pool are part of the Public Employees Retirement Fund (PERF) and are invested accordingly.

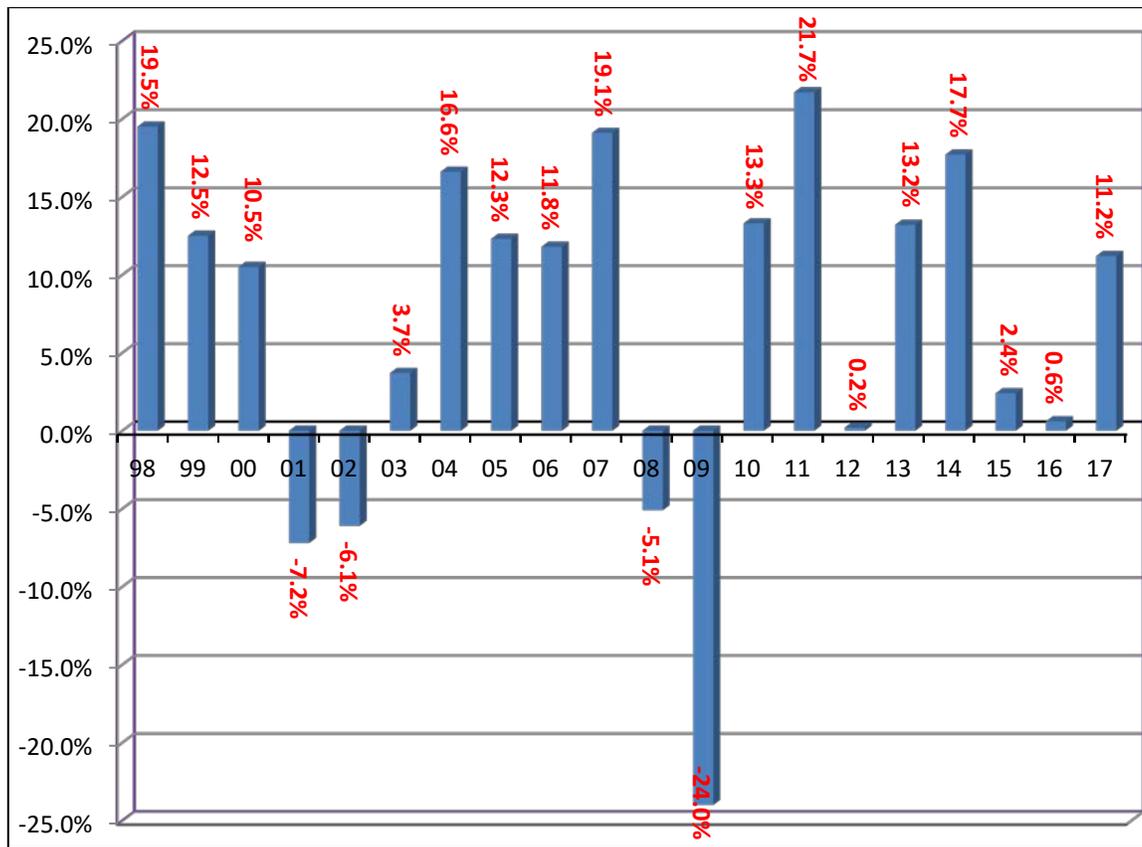
Asset Class	Market Value (Dollars in Billions)	Policy Target Allocation
Global Equity	\$156.2	51.0%
Private Equity	25.9	10.0%
Global Fixed Income	62.9	20.0%
Liquidity	15.5	1.0%
Real Assets	36.3	12.0%
Inflation Sensitive Assets	25.3	6.0%
Other	1.6	0.0%
<b>Total Fund</b>	<b>\$323.7</b>	<b>100.0%</b>



# Assets

## CalPERS History of Investment Returns

The following is a chart with the 20-year historical annual returns of the Public Employees Retirement Fund for each fiscal year ending on June 30. Beginning in 2002, the figures are reported as gross of fees.



The table below shows historical geometric mean annual returns of the Public Employees Retirement Fund for various time periods ending on June 30, 2017, (figures are reported as gross of fees). The geometric mean rate of return is the average rate per period compounded over multiple periods. It should be recognized that in any given year the rate of return is volatile. The portfolio has an expected volatility of 11.4 percent per year based on the most recent Asset Liability Modeling study. The volatility ratio is a measure of the risk of the portfolio expressed in the standard deviation of the fund's total return distribution. Consequently, when looking at investment returns it is more instructive to look at returns over longer time horizons.

### History of CalPERS Geometric Rates of Return and Volatilities

	1 Year	5 Year	10 Year	20 Year	30 Year
Geometric Return	11.2%	8.8%	4.3%	6.6%	8.2%
Volatility	—	7.3%	13.4%	11.5%	10.1%

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# Liabilities and Employer Contributions

## Development of Accrued and Unfunded Liabilities

	June 30, 2016	June 30, 2017
Members Included in the Valuation <sup>1</sup>		
Active Members	307,354	317,860
Transfers from Schools	19,313	19,070
Vested Terminations <sup>2</sup>	187,617	197,558
Receiving Payments	218,824	225,490
<b>Total</b>	<b>733,108</b>	<b>759,978</b>

Average Entry Age of Active Members	36.2	36.1
Average Age of Active Members	46.9	46.6
Average Age of Retired Members	72.5	72.6
Average Pay	\$39,935	\$40,577
Covered Payroll Prior fiscal year	\$12,274,172,160	\$12,897,950,108
Projected Payroll for Contribution Rate	\$13,021,669,245	\$13,683,435,270

	June 30, 2016	June 30, 2017
1) Present Value of Projected Benefits		
a) Active Members	\$42,897,213,782	\$48,367,592,189
b) Transferred Members	7,195,160,203	7,022,715,849
c) Terminated Members	1,824,101,140	2,035,933,722
d) Members and Beneficiaries Receiving Payments	39,142,251,810	42,171,974,178
<b>e) Total</b>	<b>\$91,058,726,935</b>	<b>\$99,598,215,938</b>
2) Present Value of Future Employer Normal Costs	\$7,064,795,326	\$8,110,382,505
3) Present Value of Future Employee Normal Costs	\$6,450,104,339	\$7,071,772,816
4) Entry Age Normal Accrued Liability		
a) Active Members [(1a) – (2) – (3)]	\$29,382,314,117	\$33,185,436,868
b) Transferred Members (1b)	7,195,160,203	7,022,715,849
c) Terminated Members (1c)	1,824,101,140	2,035,933,722
d) Members and Beneficiaries Receiving Payments (1d)	39,142,251,810	42,171,974,178
<b>e) Total</b>	<b>\$77,543,827,270</b>	<b>\$84,416,060,617</b>
5) Market Value of Assets (MVA)	\$55,784,854,423	\$60,865,459,800
6) Unfunded Liability/(Surplus) [(4e) – (5)]	\$21,758,972,847	\$23,550,600,817
<b>7) Funded Status [(5) / (4e)]</b>	<b>71.9%</b>	<b>72.1%</b>

(1) Counts of members included in the valuation are counts of the records processed by the valuation. Multiple records may exist for those who have service in more than one coverage group. This does not result in double counting liabilities.

(2) Includes non-vested terminated participants with employee contributions remaining in the plan.

# Liabilities and Employer Contributions

## Development of Employer Contributions

	June 30, 2016	June 30, 2017
Contribution Amount (as a Percentage of Payroll)		
Total Normal Cost	14.896%	15.739%
Employee Contribution	6.793%	7.000%
Employer Contribution	8.103%	8.739%
Unfunded Liability Contribution	7.428%	9.323%
<b>Total</b>	<b>15.531%</b>	<b>18.062%</b>
Contribution Required in Dollars		
Total Normal Cost	\$1,939,707,851	\$2,153,635,877
Employee Contribution	884,561,992	957,840,469
Employer Normal Cost	1,055,145,859	1,195,795,408
Unfunded Liability Contribution	967,270,839	1,275,750,831
<b>Total</b>	<b>\$2,022,416,698</b>	<b>\$2,471,546,239</b>

## Amortization Bases

The schedule on the next page shows the development of the payment on the amortization bases used to determine the employer contribution rate. Each row of the schedule gives a brief description of a base (or portion of the Unfunded Actuarial Liability), the date the base was established, the balance of the base on the valuation date, and the number of years remaining in the amortization period.

There is a one-year lag between the valuation date and the start of the contribution fiscal year.

- The assets, liabilities, and funded status of the plan are measured as of the valuation date: June 30, 2017.
- The required employer contributions determined by the valuation are for the fiscal year beginning one year after the valuation date: fiscal year 2018-19.

This one-year lag is necessary due to the amount of time needed to extract and test the membership and financial data, and the need to provide agencies with their required employer contribution well in advance of the start of the fiscal year.

The Unfunded Accrued Liability (UAL) is used to determine the employer contribution and therefore must be rolled forward one year from the valuation date to the first day of the fiscal year for which the contribution is being determined. The UAL is rolled forward each year by subtracting the expected payment on the UAL for the fiscal year and adjusting for interest. The expected payment on the UAL for a fiscal year is equal to the Expected Employer Contribution for the fiscal year minus the Expected Normal Cost for the year. The Employer Contribution for the first fiscal year is determined by the actuarial valuation one year ago. The Normal Cost Rate for the fiscal year is assumed to be the same as the rate determined by the current valuation. All expected dollar amounts are determined by multiplying the rate by the expected payroll for the applicable fiscal year, based on payroll as of the valuation date.

## Liabilities and Employer Contributions

### Schedule of Amortization Bases

Reason for Base	Date Established	Remaining Amortization Period	Balance on 6/30/2017	Expected Payment in 2017-18	Amount Remaining on 6/30/2018	Scheduled Payment for Fiscal Year 2018-19	Payment as Percentage of Payroll
Assumption Change	6/30/2009	12	\$971,835,421	\$98,909,131	\$941,016,754	\$101,102,521	0.739%
Assumption Change	6/30/2011	14	1,313,131,616	120,374,165	1,285,241,066	122,927,212	0.898%
Assumption Change	6/30/2015	18	4,701,519,272	174,820,333	4,867,104,152	267,443,180	1.955%
Assumption Change	6/30/2017	20	1,282,390,779	(59,250,603)	1,438,363,705	27,111,289	0.198%
Fresh Start (Gain/Loss)	6/30/2004	17	2,785,095,587	225,160,392	2,757,180,891	229,622,682	1.678%
(Gain)/Loss In 2009	6/30/2009	22	859,381,652	59,581,850	861,021,198	60,633,887	0.443%
(Gain)/Loss In 2010	6/30/2010	23	418,514,220	28,308,100	420,046,250	28,796,358	0.210%
(Gain)/Loss In 2011	6/30/2011	24	(916,821,456)	(60,596,797)	(921,645,481)	(61,617,651)	(0.450%)
(Gain)/Loss	Various	26	(331,748,683)	(21,025,643)	(334,427,976)	(21,363,455)	(0.156%)
(Gain)/Loss	6/30/2014	27	4,141,920,042	167,051,911	4,274,284,266	226,368,332	1.654%
(Gain)/Loss	6/30/2015	28	3,957,222,807	108,123,932	4,137,027,907	164,721,848	1.204%
(Gain)/Loss	6/30/2016	29	4,732,548,818	66,563,464	5,012,599,961	135,099,889	0.987%
(Gain)/Loss	6/30/2017	30	(364,389,258)	(22,826,431)	(367,609,783)	(5,095,263)	(0.037%)
<b>Total</b>			<b>\$23,550,600,817</b>	<b>\$885,193,805</b>	<b>\$24,370,202,909</b>	<b>\$1,275,750,831</b>	<b>9.323%</b>

## Liabilities and Employer Contributions

### (Gain)/Loss Analysis

To calculate the cost requirements of the plan, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year, actual experience is compared to the expected experience based on the actuarial assumptions. This results in actuarial gains or losses, as shown below.

<b>1) Total (Gain)/Loss for the Year</b>	
a) Unfunded Accrued Liability (UAL) as of June 30, 2016	\$21,758,972,847
b) Expected Payment on the UAL during 2016-2017	731,366,102
c) Interest through June 30, 2017 $[(.07375 \times (1a) - ((1.07375)^{1/2} - 1) \times (1b)]$	1,604,992,551
d) Expected UAL before Other Changes $[(1a) - (1b) + (1c)]$	22,632,599,296
e) Change Due to Plan Changes	-
f) Change Due to Assumptions Change	1,282,390,779
g) Expected UAL After All Other Changes $[(1d) + (1e) + (1f)]$	23,914,990,075
h) Actual Unfunded Accrued Liability as of June 30, 2017	23,550,600,817
<b>i) Total (Gain)/Loss for 2016-2017 [(1h) - (1g)]</b>	<b>(\$364,389,258)</b>
<b>2) Contribution (Gain)/Loss for the Year</b>	
a) Expected Contribution (Employer and Employee)	\$2,621,530,926
b) Actual Contributions	2,681,326,659
<b>c) Contribution (Gain)/Loss for 2016-17 [(2a) - (2b)]</b>	<b>(\$59,795,733)</b>
<b>3) Asset (Gain)/Loss for the Year</b>	
a) Market Value of Assets as of June 30, 2016	\$55,784,854,424
b) Prior Fiscal Year Receivables	(95,806,080)
c) Current Fiscal Year Receivables	95,503,089
d) Contributions Received	2,681,326,659
e) Benefits and Refunds Paid	(3,724,909,591)
f) Transfers and Miscellaneous Adjustments	15,624
g) Expected Interest $[0.07375 \times (3a + 3b) + ((1.07375)^{1/2} - 1) \times ((3d) + (3e) + (3f))]$	4,138,252,320
h) Expected Assets as of June 30, 2017 $[(3a) + (3b) + (3c) + (3d) + (3e) + (3f) + (3g)]$	58,879,236,445
i) Market Value of Assets as of June 30, 2017	60,865,459,800
<b>j) Asset (Gain)/Loss for 2016-17 [(3h) - (3i)]</b>	<b>(\$1,986,223,355)</b>
<b>4) Liability (Gain)/Loss for the Year</b>	
a) Total (Gain)/Loss (1i)	(\$364,389,258)
b) Contribution (Gain)/Loss (2g)	(59,795,733)
c) Asset (Gain)/Loss (3j)	(1,986,223,355)
<b>d) Liability (Gain)/Loss for 2016-17 [(4a) - (4b) - (4c)]</b>	<b>\$1,681,629,830</b>

### Reconciliation of Employer Contributions

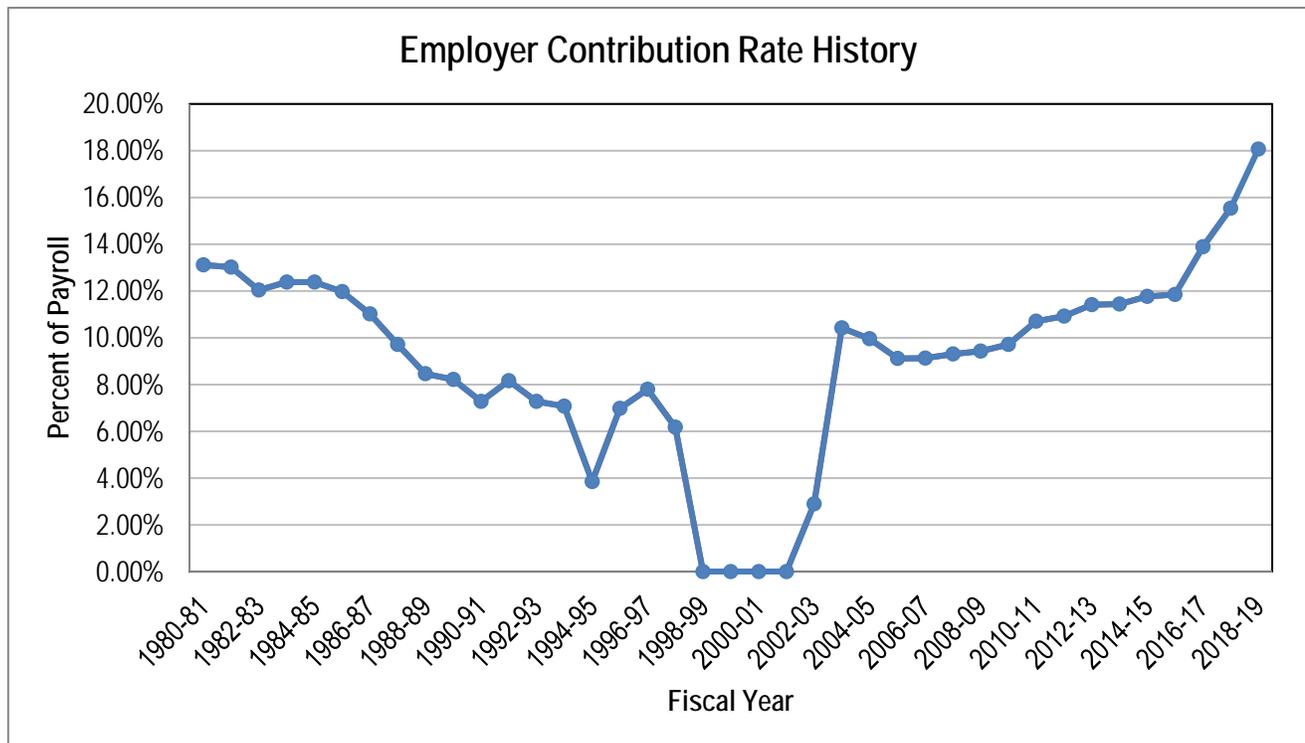
	Percentage of Projected Payroll	Estimated \$ Based on Projected Payroll
1) Contribution for 7/1/16-6/30/17	15.531%	\$2,022,416,698
2) Effect of changes since the prior year annual valuation		
a) Effect of unexpected changes in demographics and financial results	(0.037%)	(5,095,263)
b) Effect of plan changes	0.000%	0
c) Effect of changes in assumptions/methods	0.644%	88,139,411
d) Effect of progression of amortization bases and change in payroll	1.924%	366,085,393
e) Net effect of the changes above [sum of a through d]	2.531%	449,129,541
<b>3) Contribution for 7/1/18 - 6/30/19 [(1) + 2e)]</b>	<b>18.062%</b>	<b>\$2,471,546,239</b>

# Liabilities and Employer Contributions

## Employer Contribution Rate History

The table below provides a history of the contribution rates for the Schools Pool. In cases where the contribution rate changed during the course of a fiscal year, the entry shown is the weighted average of the rates effective during the fiscal year.

Fiscal Year	Valuation Date	Employer Normal Cost	Unfunded Liability Contribution	Total Employer Contribution
2018-19	6/30/2017	8.739%	9.323%	18.062%
2017-18	6/30/2016	8.103%	7.428%	15.531%
2016-17	6/30/2015	8.242%	5.646%	13.888%
2015-16	6/30/2014	7.621%	4.226%	11.847%
2014-15	6/30/2013	7.814%	3.957%	11.771%
2013-14	6/30/2012	7.313%	4.129%	11.442%
2012-13	6/30/2011	7.415%	4.002%	11.417%
2011-12	6/30/2010	7.132%	3.791%	10.923%
2010-11	6/30/2009	7.173%	3.534%	10.707%
2009-10	6/30/2008	7.410%	2.299%	9.709%



# Liabilities and Employer Contributions

## Funding History (dollars in millions)

Shown below is the history of funding status for the pool. One could view the trend in the ratio of the unfunded liability to covered payroll as a measure of the ability of the employer to address the unfunded liability.

Valuation Date	Accrued Liabilities	Market Value of Assets (MVA)	Unfunded Liabilities/(Surplus)	Funded Ratio	Projected Payroll for Contribution	Unfunded/(Surplus) as a % of Payroll
6/30/17	\$84,416	\$60,865	\$23,551	72.1%	\$13,683	172.1%
6/30/16	77,544	55,785	21,759	71.9%	13,022	167.1%
6/30/15	73,325	56,814	16,511	77.5%	12,098	136.5%
6/30/14	65,600	56,838	8,761	86.6%	11,294	77.6%
6/30/13	61,487	49,482	12,005	80.5%	10,424	115.2%
6/30/12	59,439	44,854	14,585	75.5%	10,242	142.4%
6/30/11	58,358	45,901	12,457	78.7%	10,540	118.2%
6/30/10	55,307	38,435	16,872	69.5%	11,283	149.5%
6/30/09	52,493	34,146	18,347	65.0%	11,110	165.1%
6/30/08	48,538	45,548	2,990	93.8%	11,138	26.8%
6/30/07	44,810	48,293	(3,483)	107.8%	10,250	(34.0%)
6/30/06	41,409	40,852	556	98.7%	9,881	5.6%
6/30/05	38,368	36,898	1,469	96.2%	9,223	15.9%
6/30/04	35,933	32,828	3,104	91.4%	9,069	34.2%
6/30/03	33,793	28,182	5,611	83.4%	9,079	61.8%
6/30/02	31,271	27,690	3,581	88.5%	8,344	42.9%
6/30/01	27,946	30,308	(2,361)	108.4%	7,912	(29.8%)
6/30/00	25,474	33,295	(7,821)	130.7%	7,053	(110.9%)
6/30/99	21,216	30,918	(9,702)	145.7%	5,961	(162.8%)
6/30/98	19,499	27,874	(8,374)	142.9%	5,445	(153.8%)
6/30/97	17,583	23,499	(5,916)	133.6%	4,907	(120.5%)
6/30/96	17,572	19,706	(2,135)	112.1%	5,146	(41.5%)
6/30/95	16,422	17,314	(892)	105.4%	5,351	(16.7%)
6/30/94	15,136	15,373	(238)	101.6%	5,140	(4.6%)
6/30/93	13,575	14,956	(1,381)	110.2%	4,853	(28.4%)
6/30/92	12,856	13,816	(960)	107.5%	4,883	(19.7%)
6/30/91	12,022	13,301	(1,298)	110.8%	4,850	(26.8%)
6/30/90	11,249	9,298	1,951	82.7%	4,393	44.4%
6/30/89	9,941	9,926	16	99.8%	4,054	0.4%
6/30/88	9,395	8,341	1,054	88.8%	3,769	28.0%
6/30/87	8,583	8,174	409	95.2%	3,605	11.3%

# Risk Analysis

- 21 Analysis of Future Investment Return Scenarios
- 22 Analysis of Discount Rate Sensitivity
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# Risk Analysis

## Analysis of Future Investment Return Scenarios

Analysis was performed to determine the effects of various future investment returns on required employer contributions. The projections below provide a range of results based on five investment return scenarios assumed to occur during the next four fiscal years (2017-18, 2018-19, 2019-20 and 2020-21). The projections also assume that all other actuarial assumptions will be realized, including the assumption changes described on page 6 of this report, and that no further changes to contributions, benefits, or funding will occur.

Each of the five investment return scenarios assumes a return of 8.6 percent for fiscal year 2017-18. For fiscal years 2018-19, 2019-20, and 2020-21 each scenario assumes an alternate fixed annual return. The fixed return assumptions for the five scenarios are 1.0 percent, 4.0 percent, 7.0 percent, 9.0 percent and 12.0 percent.

The alternate investment returns were chosen based on stochastic analysis of possible future investment returns over the four-year period ending June 30, 2021. Using the expected returns and volatility of the asset classes in which the funds are invested, we produced five thousand stochastic outcomes for this period based on the recently completed Asset Liability Management process. We then selected annual returns that approximate the 5<sup>th</sup>, 25<sup>th</sup>, 50<sup>th</sup>, 75<sup>th</sup>, and 95<sup>th</sup> percentiles for these outcomes. For example, of all the 4-year outcomes generated in the stochastic analysis, approximately 25 percent of them had an average annual return of 4.0 percent or less.

Required contributions outside of this range are also possible. In particular, whereas it is unlikely that investment returns will average less than 1.0 percent or greater than 12.0 percent over this four-year period, the possibility of a single investment return less than 1.0 percent or greater than 12.0 percent in any given year is much greater.

Assumed Annual Return From 2018-19 through 2020-21	Projected Employer Contributions			
	2019-20	2020-21	2021-22	2022-23
1.0%	20.7%	24.0%	26.3%	28.7%
4.0%	20.7%	23.7%	25.4%	27.0%
Assumed 7.0%	20.7%	23.4%	24.5%	25.0%
9.0%	20.7%	23.2%	23.9%	23.9%
12.0%	20.7%	22.9%	22.9%	21.9%

Given the temporary suspension of the Risk Mitigation Policy during the period over which the discount rate assumption is being phased down to 7.0 percent, the projections above were performed without reflection of any possible impact of this Policy.

The projected normal cost percentages do reflect that the normal cost will decline over time as new employees are hired into PEPRA or other lower cost benefit tiers.

# Risk Analysis

## Analysis of Discount Rate Sensitivity

Shown below are various valuation results as of June 30, 2017 assuming alternate discount rates. Results are shown using the current discount rate of 7.375 percent as well as alternate discount rates of 6.0 percent, 7.0 percent, and 8.0 percent. The alternate rate of 7.0 percent was selected since the Board has adopted this rate as the final discount rate at the end of the three-year phase-in of the reduction in this assumption. The rates of 6.0 percent and 8.0 percent were selected since they illustrate the impact of a 1 percent increase or decrease to the 7.0 percent assumption. This analysis shows the potential plan impacts if the PERF were to realize investment returns of 6.0 percent, 7.0 percent, or 8.0 percent over the long-term.

This type of analysis gives the reader a sense of the long-term risk to required contributions.

As of June 30, 2017	Sensitivity Analysis					
	Employer Normal Cost	Unfunded Liability Rate	Total Employer Rate	Accrued Liability	Unfunded Accrued Liability	Funded Status
7.375% (current discount rate)	8.739%	9.323%	18.062%	\$84,416,060,617	\$23,550,600,817	72.1%
6.0%	14.5%	17.0%	31.5%	\$100,748,860,697	\$39,883,400,897	60.4%
7.0%	10.1%	11.7%	21.8%	\$88,889,775,115	\$28,024,315,315	68.5%
8.0%	6.8%	6.4%	13.2%	\$79,063,295,990	\$18,197,836,190	77.0%

Note that the change in accrued liability due to the discount rate change, in the scenarios above, was amortized over 20 years as a level percentage of pay. In the case of a surplus, rates were calculated to equal the employer normal cost rate. This is based on a provision in the Public Employees' Pension Reform Act of 2013 (PEPRA) that requires a minimum employer contribution rate in combination with employee contributions shall not be less than the normal cost rate. This analysis does not take into consideration the impact of changing the discount rate on the PEPRA member employee contribution rate. Numbers may not add, due to rounding.

# Risk Analysis

## Volatility Ratios

The actuarial calculations supplied in this communication are based on a number of assumptions about long-term demographic and economic behavior. Unless these assumptions (terminations, deaths, disabilities, retirements, salary growth, and investment return) are exactly realized each year, there will be differences on a year-to-year basis. The year-to-year differences between actual experience and the assumptions are called actuarial gains and losses and serve to lower or raise the employer's rates from one year to the next. Therefore, the rates will inevitably fluctuate, especially due to the ups and downs of investment returns.

### Asset Volatility Ratio (AVR)

Plans that have higher asset-to-payroll ratios experience more volatile employer rates due to investment return volatility. For example, a plan with an asset-to-payroll ratio of 8 may experience twice the contribution volatility due to investment return volatility than a plan with an asset-to-payroll ratio of 4. Shown below is the asset volatility ratio, a measure of the plan's current volatility. It should be noted that this ratio is a measure of the current situation. It increases over time but generally tends to stabilize as the plan matures.

### Liability Volatility Ratio (LVR)

Plans that have higher liability-to-payroll ratios experience more volatile employer rates due to investment return and changes in liability. For example, a plan with a liability-to-payroll ratio of 8 is expected to have twice the contribution volatility of a plan with a liability-to-payroll ratio of 4. The liability volatility ratio is also included in the table below. It should be noted that this ratio indicates a longer-term potential for contribution volatility. The asset volatility ratio, described above, will tend to move closer to the liability volatility ratio as the plan matures. Since the liability volatility ratio is a long-term measure, it is shown below at the current discount rate (7.375 percent) as well as the discount rate the Board has adopted to determine the contribution requirement in the June 30, 2019 actuarial valuation (7.00 percent).

### Contribution Volatility

Plan	As of June 30, 2017
1) Market Value of Assets without Receivables	\$60,769,956,711
2) Payroll	\$12,897,950,108
3) Asset Volatility Ratio (AVR) [(1) / (2)]	4.7
4) Accrued Liability (7.375% discount rate)	\$84,416,060,617
5) Liability Volatility Ratio (LVR) [(4) / (2)]	6.5
6) Accrued Liability (7.00% discount rate)	\$88,889,775,115
7) Projected Liability Volatility Ratio [(6) / (2)]	6.9

# Appendices

A-1 Appendix A – Statement of Actuarial Methods and Assumptions

B-1 Appendix B – Principal Plan Provisions

C-1 Appendix C – Participant Data

D-1 Appendix D – Normal Cost Information

E-1 Appendix E – Glossary of Actuarial Terms

# Appendix A – Statement of Actuarial Methods and Assumptions

## Actuarial Data

As stated in the Actuarial Certification, the data which serves as the basis for this valuation has been obtained from the various CalPERS databases. We have reviewed the valuation data and believe that it is reasonable and appropriate in aggregate. We are unaware of any potential data issues that would have a material effect on the results of this valuation, except that data does not always contain the latest salary information for former members now in reciprocal systems and does not recognize the potential for unusually large salary deviation in certain cases such as elected officials. Therefore, salary information in these cases may not be accurate. These situations are relatively infrequent, however, and when they do occur, they generally do not have a material impact on the employer contribution rates.

## Actuarial Methods

### Actuarial Cost Method

The actuarial cost method used is the Entry Age Normal Cost Method. Under this method, projected benefits are determined for all members and the associated liabilities are spread in a manner that produces level annual cost as a percent of pay in each year from the member's age of hire (entry age) to their assumed retirement age on the valuation date. The cost allocated to the current fiscal year is called the normal cost.

The actuarial accrued liability for active members is then calculated as the portion of the total cost of the plan allocated to prior years. The actuarial accrued liability for members currently receiving benefits and for members entitled to deferred benefits is equal to the present value of the benefits expected to be paid. Normal costs are applicable for active members.

### Amortization of Unfunded Actuarial Accrued Liability

The excess of the total actuarial accrued liability over the market value of plan assets is called the unfunded actuarial accrued liability (UAL). Funding requirements are determined by adding the normal cost and an amortization payment toward the unfunded liability. The unfunded liability is amortized as a "level percent of pay". Commencing with the June 30, 2014 valuation for the Schools Pool, all new gains or losses are amortized over a fixed 30-year period with a 5-year ramp up at the beginning and a 5-year ramp down at the end of the amortization period. All changes in liability due to plan amendments (other than golden handshakes) are amortized over a 20-year period with no ramp. Changes in actuarial assumptions or changes in actuarial methodology are amortized over a 20-year period with a 5-year ramp up at the beginning and a 5-year ramp down at the end of the amortization period. Changes in unfunded accrued liability due to a Golden Handshake will be amortized over a period of five years.

The 5-year ramp up means that the payments in the first four years of the amortization period are 20 percent, 40 percent, 60 percent and 80 percent of the "full" payment which begins in year five. The 5-year ramp down means that the reverse is true in the final four years of the amortization period.

# Appendix A - Statement of Actuarial Methods and Assumptions

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## Actuarial Methods (continued)

### Exceptions for Inconsistencies:

An exception to the amortization rules above is used whenever their application results in inconsistencies. In these cases, a “fresh start” approach is used. This means that the current unfunded actuarial liability is projected and amortized over a set number of years. For example, a fresh start is needed in the following situations:

- 1) When a positive payment would be required on a negative unfunded actuarial liability (or conversely a negative payment on a positive unfunded actuarial liability); or
- 2) When there are excess assets, rather than an unfunded liability. In this situation, a 30-year fresh start is used.

It should be noted that the actuary may determine that a fresh start is necessary under other circumstances. In all cases of a fresh start, the period is set by the actuary at what is deemed appropriate; however, the period will not be greater than 30 years.

### Asset Valuation Method

It is the policy of the CalPERS Board of Administration to use professionally accepted amortization methods to eliminate a surplus or an unfunded liability in a manner that maintains benefit security for the members of the System while minimizing substantial variations in required employer contribution rates. On April 17, 2013, the CalPERS Board of Administration approved a recommendation to change the CalPERS amortization and rate smoothing policies. Beginning with the June 30, 2014 valuation for the Schools Pool that sets the 2015-16 rates, CalPERS employs a policy that amortizes all gains and losses over a fixed 30-year period. The increase or decrease in the rate is then spread directly over a 5-year period. This method is referred to as “direct rate smoothing.” CalPERS no longer uses an actuarial value of assets and only uses the market value of assets. The direct rate smoothing method is comparable to a method using a 5-year asset smoothing period with no actuarial value of asset corridor and a 25-year amortization period for gains and losses.

### PEPRA Normal Cost Rate Methodology

Per Government Code Section 7522.30(b) the “normal cost rate” shall mean the annual actuarially determined normal cost for the plan of retirement benefits provided to the new member and shall be established based on actuarial assumptions used to determine the liabilities and costs as part of the annual actuarial valuation. The plan of retirement benefits shall include any elements that would impact the actuarial determination of the normal cost, including, but not limited to, the retirement formula, eligibility and vesting criteria, ancillary benefit provisions, and any automatic cost-of-living adjustments as determined by the public retirement system.

Each plan is considered to be stable with a sufficiently large demographic of actives. It is preferable to determine normal cost using a large active population ongoing so that this rate remains relatively stable. The total PEPRA normal cost will be calculated using all active members within a non-pooled plan until the number of members covered under the PEPRA formula meets either:

- 1) 50 percent of the active population, or
- 2) 25 percent of the active population and 100 or more PEPRA members

The total PEPRA normal cost is based on the active PEPRA population in the Schools Pool.

Accordingly, the total normal cost will be funded equally between employer and employee based on the demographics of the employees of that employer.

# Appendix A - Statement of Actuarial Methods and Assumptions

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## Actuarial Methods (continued)

### Purchasing Power Protection Act (PPPA) Method

PPPA benefits are cost-of-living adjustments intended to maintain the individual's current retirement benefit at 75 percent of the original benefit at retirement adjusted for inflation since retirement. The PPPA benefit is paid, if necessary, in addition to any other cost-of-living adjustment provided under the terms of the plan. Prior to January 1, 2001, there was a single PPPA pool covering all CalPERS employers. However, commencing January 1, 2001, separate PPPA pools were established. A pool was set up for all State plans and a separate pool for School employers. The public agencies were removed entirely from PPPA pooling resulting in each public agency plan paying for its own PPPA benefits. The creation of separate pools effectively eliminates the cross subsidization between the State, Schools and public agencies.

For the Schools Pool, the total annual outlay for PPPA benefits is limited by State statute to earnings of up to 1.1 percent of accumulated member contributions. If this annual outlay is insufficient to provide the PPPA benefits in a given fiscal year, the 75 percent maintenance target would be proportionately reduced. Since the inception of the PPPA benefit program, 1.1 percent has proved more than sufficient to provide the 75 percent maintenance. Under the inflation assumption of 2.75 percent compounded annually, the 1.1 percent appears to remain more than sufficient in the foreseeable future.

The actuarial model mimics the PPPA administrative procedure by deriving the employer contribution rate for the plan as the lesser of two separate actuarially computed rates:

- 1) The rate that results if a full 1.1 percent investment return on the value of each future year's employee assets in the plan is used for that plan's PPPA payments; or
- 2) The rate that results if the plan pays the full 75 percent purchasing power for itself.

In this way, those plans for which future PPPA costs equal or exceed a 1.1 percent return on current and future employee assets are charged an employer rate that replaces the 1.1 percent return on employee assets. Those plans that require less than the 1.1 percent return on current and future employee assets to maintain 75 percent purchasing power are charged the rate necessary to maintain the 75 percent purchasing power. It must be noted that nothing is charged in the rates for any cross-subsidization.

### Internal Revenue Code Section 415

The limitations on benefits imposed by Internal Revenue Code Section 415 are taken into account in this valuation. Each year, the impact of any changes in the benefit limitation since the prior valuation is included and amortized as part of the actuarial gain or loss base.

### Internal Revenue Code Section 401(a)(17)

The limitations on compensation imposed by Internal Revenue Code Section 401(a)(17) are taken into account in this valuation. Each year, the impact of any changes in the compensation limitation since the prior valuation is included and amortized as part of the actuarial gain or loss base.

### Accounts Receivable

In preparing valuations and setting employer contribution rates, the asset figures used include accounts receivable. The CalPERS Actuarial Office assumes that all assets are accruing interest at the actuarially assumed rate. Therefore, the rates depicted assume that all payments have been made and are accruing interest.

# Appendix A - Statement of Actuarial Methods and Assumptions

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## Actuarial Assumptions

In 2014, CalPERS completed a 2-year asset liability management study incorporating actuarial assumptions and strategic asset allocation. On February 19, 2014, the CalPERS Board of Administration adopted relatively modest changes to the asset allocation that reduced the expected volatility of returns. The adopted asset allocation was expected to have a long-term blended return that continued to support a discount rate assumption of 7.5 percent at that time. The Board also approved several changes to the demographic assumptions that more closely aligned with actual experience. The most significant of these is mortality improvement to acknowledge the greater life expectancies we are seeing in our membership and expected continued improvements. These new actuarial assumptions were first used in the June 30, 2015 valuation to set the fiscal year 2016-17 contribution for the Schools Pool employers.

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2017 actuarial valuations for the Schools Pool. The minimum employer contributions for fiscal year 2018-19 determined in the June 30, 2017 valuation were calculated using a discount rate of 7.375 percent. The projected employer contributions are calculated assuming that the discount rate will be lowered to 7.25 percent for June 30, 2018 and 7.00 percent the following year as adopted by the Board. The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate schedule provides a more realistic assumption for the long term investment return of the fund.

Notwithstanding the Board's decision to phase into a 7.0 percent discount rate, subsequent analysis of the expected investment return of CalPERS assets or changes to the investment allocation may result in a change to this three-year discount rate schedule.

For more details and additional rationale for the selection of the actuarial assumptions, please refer to the CalPERS Experience Study and Review of Actuarial Assumptions report from January 2014 that can be found on the CalPERS website under: "Forms and Publications". Click on "View All" and search for Experience Study.

All actuarial assumptions (except the discount rates used for the hypothetical termination liability) represent an estimate of future experience rather than observations of the estimates inherent in market data.

# Appendix A - Statement of Actuarial Methods and Assumptions

## Economic Assumptions

### Discount Rate

The prescribed discount rate is 7.375 percent compounded annually (net of expenses) as of June 30, 2017, (reduced from 7.5 in the prior valuation). The discount rate will be further reduced to 7.25 percent compounded annually (net of expenses) as of June 30, 2018, and to 7.0 percent compounded annually (net of expenses) as of June 30, 2019.

### Salary Growth

Annual increases vary by entry age and duration of service. A sample of assumed increases is shown below.

Duration of Service	Entry Age		
	20	30	40
0	9.00%	8.80%	8.20%
3	6.50%	6.30%	5.80%
5	5.80%	5.60%	5.10%
10	4.60%	4.50%	4.10%
15	4.20%	4.10%	3.80%
20	3.90%	3.80%	3.50%
25	3.70%	3.50%	3.30%
30	3.50%	3.30%	3.10%

### Overall Payroll Growth

3 percent compounded annually (used in projecting the payroll over which the unfunded liability is amortized). The payroll growth rate will be further reduced to 2.875 percent as of June 30, 2018, and to 2.75 percent as of June 30, 2019.

### Inflation

2.75 percent compounded annually. The inflation rate will be further reduced to 2.625 percent as of June 30, 2018, and to 2.5 percent as of June 30, 2019.

## Demographic Assumptions

### Post-Retirement Mortality

Rates vary by age, type of retirement, and gender. See sample rates in table below.

Age	Healthy Recipients		Non-Industrial Disabled (Not Job-Related)		Industrial Disabled (Job-Related)	
	Male	Female	Male	Female	Male	Female
50	0.00501	0.00466	0.01680	0.01158	0.00501	0.00466
55	0.00599	0.00416	0.01973	0.01149	0.00599	0.00416
60	0.00710	0.00436	0.02289	0.01235	0.00754	0.00518
65	0.00829	0.00588	0.02451	0.01607	0.01122	0.00838
70	0.01305	0.00993	0.02875	0.02211	0.01635	0.01395
75	0.02205	0.01722	0.03990	0.03037	0.02834	0.02319
80	0.03899	0.02902	0.06083	0.04725	0.04899	0.03910
85	0.06969	0.05243	0.09731	0.07762	0.07679	0.06251
90	0.12974	0.09887	0.14804	0.12890	0.12974	0.09887
95	0.22444	0.18489	0.22444	0.21746	0.22444	0.18489
100	0.32536	0.30017	0.32536	0.30017	0.32536	0.30017

The post-retirement mortality rates above include 20 years of projected on-going mortality improvements using Scale BB published by the Society of Actuaries.

# Appendix A - Statement of Actuarial Methods and Assumptions

## Demographic Assumptions (continued)

### Marital Status

For active members 85 percent are assumed to be married upon retirement.

### Age of Spouse

It is assumed that female spouses are 3 years younger than male spouses.

### Terminated Members

It is assumed that terminated members refund immediately if non-vested. Terminated members who are vested are assumed to follow the same service retirement pattern as active members but with a load to reflect the expected higher rates of retirement, especially at lower ages. The following table shows the load factors that are applied to the service retirement assumption for active members to obtain the service retirement pattern for separated vested members:

	Age 50	Age 51	Age 52	Age 53 and above
Load Factor	190%	110%	110%	100%

### Termination with Refund

Rates vary by entry age and service. See sample rates in the table below.

Duration of Service	Entry Age				
	20	25	30	35	40
5	0.1730	0.1627	0.1525	0.1422	0.1319
6	0.1585	0.1482	0.1379	0.1277	0.1174
7	0.1440	0.1336	0.1234	0.1131	0.1028
8	0.1295	0.1192	0.1089	0.0987	0.0884
9	0.1149	0.1046	0.0944	0.0841	0.0738
10	0.0278	0.0249	0.0221	0.0192	0.0164
14	0.0172	0.0147	0.0122	0.0098	0.0074
15	0.0115	0.0094	0.0074	0.0053	0.0032
19	0.0073	0.0055	0.0038	0.0020	0.0002
20	0.0037	0.0023	0.0010	0.0002	0.0002
24	0.0015	0.0003	0.0002	0.0002	0.0002
25	0.1730	0.1627	0.1525	0.1422	0.1319
29	0.1585	0.1482	0.1379	0.1277	0.1174
30	0.1440	0.1336	0.1234	0.1131	0.1028

# Appendix A - Statement of Actuarial Methods and Assumptions

## Demographic Assumptions (continued)

### Termination with Vested Deferred Benefits

Rates vary by entry age and service. See sample rates in the table below.

Duration of Service	Entry Age				
	20	25	30	35	40
5	0.0816	0.0733	0.0649	0.0566	0.0482
6	0.0782	0.0697	0.0613	0.0527	0.0443
7	0.0745	0.0660	0.0573	0.0487	0.0400
8	0.0708	0.0621	0.0534	0.0446	0.0359
9	0.0671	0.0582	0.0493	0.0404	0.0316
10	0.0629	0.0540	0.0450	0.0359	—
14	0.0558	0.0462	0.0367	0.0272	—
15	0.0537	0.0440	0.0344	—	—
19	0.0443	0.0344	0.0243	—	—
20	0.0420	0.0317	—	—	—
24	0.0319	0.0211	—	—	—
25	0.0291	—	—	—	—
29	0.0170	—	—	—	—
30	—	—	—	—	—

- When a member is eligible to retire, the termination with vested benefits probability is set to zero.
- After termination with vested benefits, a miscellaneous member is assumed to retire at age 59 and a safety member at age 54.

### Non-Industrial (Not Job-Related) Death and Disability

Rates vary by age and gender. See sample rates in the table below.

Attained Age	Non-Industrial Death (Not Job-Related)		Non-Industrial Disability (Not Job-Related)	
	Male	Female	Male	Female
20	0.00031	0.00020	0.00028	0.00026
25	0.00040	0.00023	0.00010	0.00012
30	0.00049	0.00025	0.00011	0.00016
35	0.00057	0.00035	0.00053	0.00043
40	0.00075	0.00050	0.00149	0.00101
45	0.00106	0.00071	0.00295	0.00188
50	0.00155	0.00100	0.00388	0.00244
55	0.00228	0.00138	0.00358	0.00205
60	0.00308	0.00182	0.00306	0.00139

# Appendix A - Statement of Actuarial Methods and Assumptions

## Demographic Assumptions (continued)

### Service Retirement - Classic Members

Rates vary by age and service. See sample rates in the table below.

Attained Age	Years of Service						
	5	10	15	20	25	30	35
50	0.0050	0.0090	0.0130	0.0150	0.0160	0.0180	0.0220
52	0.0060	0.0120	0.0170	0.0200	0.0220	0.0250	0.0290
54	0.0120	0.0240	0.0330	0.0390	0.0440	0.0490	0.0570
56	0.0200	0.0390	0.0550	0.0650	0.0720	0.0810	0.0950
58	0.0250	0.0500	0.0700	0.0830	0.0920	0.1030	0.1210
60	0.0370	0.0730	0.1020	0.1210	0.1340	0.1500	0.1760
62	0.0760	0.1510	0.2120	0.2500	0.2780	0.3110	0.3660
65	0.0910	0.1800	0.2510	0.2970	0.3310	0.3700	0.4350
70	0.0660	0.1310	0.1830	0.2160	0.2410	0.2700	0.3160
75	0.0550	0.1080	0.1510	0.1790	0.1990	0.2230	0.2620

### Service Retirement - PEPRA Members

Rates vary by age and service. See sample rates in the table below.

Attained Age	Years of Service						
	5	10	15	20	25	30	35
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
52	0.0040	0.0080	0.0120	0.0140	0.0150	0.0180	0.0200
54	0.0080	0.0170	0.0230	0.0270	0.0310	0.0340	0.0400
56	0.0140	0.0270	0.0390	0.0460	0.0500	0.0570	0.0670
58	0.0190	0.0380	0.0530	0.0620	0.0690	0.0770	0.0910
60	0.0300	0.0580	0.0820	0.0970	0.1070	0.1200	0.2930
62	0.0610	0.1210	0.1700	0.2000	0.2220	0.2490	0.2930
65	0.0820	0.1620	0.2260	0.2670	0.2980	0.3330	0.3920
70	0.0660	0.1310	0.1830	0.2160	0.2410	0.2700	0.3160
75	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

## Miscellaneous Loading Factors

### Credit for Unused Sick Leave

Total years of service is increased by 1 percent for those plans with the provision providing Credit for Unused Sick Leave.

### Norris Decision (Best Factors)

Employees hired prior to July 1, 1982 have projected benefit amounts increased in order to reflect the use of "Best Factors" in the calculation of optional benefit forms. This is due to a 1983 Supreme Court decision, known as the Norris decision, which required males and females to be treated equally in the determination of benefit amounts. Consequently, anyone already employed at that time is given the best possible conversion factor when optional benefits are determined. No loading is necessary for employees hired after July 1, 1982.

# Appendix B – Principal Plan Provisions

The following is a description of the principal plan provisions for the most representative group used in calculating costs and liabilities of this plan. Many of the statements in this summary are general in nature, and are intended to provide a summary of the complex Public Employees' Retirement Law. The law itself governs in all situations.

## Service Retirement

### Eligibility

A CalPERS Classic member becomes eligible for Service Retirement upon attainment of age 50 with at least 5 years of credited service (total service across all CalPERS employers, and with certain other Retirement Systems with which CalPERS has reciprocity agreements). PEPRA Schools members become eligible for Service Retirement upon attainment of age 52 with at least 5 years of service.

### Benefit

The Service Retirement benefit is a monthly allowance equal to the product of benefit factor, years of service, and final compensation.

- The benefit factor for classic members comes from the **2% at 55** benefit factor table. New PEPRA members hired on or after January 1, 2013 are subject to the **2% at 62** benefit factor table. The factor depends on the member's age at retirement. Listed below are the factors for retirement at whole year ages:

Retirement Age	2% @ 55 Factor	2% @ 62 Factor
50	1.100%	1.092%
51	1.280%	1.156%
52	1.460%	1.224%
53	1.640%	1.296%
54	1.820%	1.376%
55	2.000%	1.460%
59	2.064%	1.552%
57	2.126%	1.650%
58	2.188%	1.758%
59	2.250%	1.874%
60	2.314%	2.000%
61	2.376%	2.134%
62	2.438%	2.272%
63	2.500%	2.418%
64	2.500%	2.418%
65	2.500%	2.418%
66	2.500%	2.418%
67 & Up	2.500%	2.418%

- The *years of service* is the amount credited by CalPERS to a member while he or she is employed in this group (or for other periods that are recognized under the employer's contract with CalPERS). For a member who has earned service with multiple CalPERS employers, the benefit from each employer is calculated separately according to each employer's contract, and then added together for the total allowance. Any unused sick leave accumulated at the time of retirement will be converted to credited service at the rate of 0.004 years of service for each day of sick leave.

## Appendix B – Principal Plan Provisions

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### Service Retirement (continued)

- The *final compensation* is the monthly average of the member's highest 12 consecutive months' full-time equivalent monthly pay (no matter which CalPERS employer paid this compensation). For new PEPRA members hired after January 1, 2013 final compensation is based on the monthly average of the member's highest 36 consecutive months' full-time equivalent monthly pay. PEPRA members have a cap on the annual salary that can be used to calculate final compensation for all new members based on the Social Security Contribution and Benefit Base. For employees that participate in Social Security this cap is \$117,020 for 2017 and for those employees that do not participate in social security the cap for 2017 is \$140,424, the equivalent of 120 percent of the 2017 Contribution and Benefit Base. Adjustments to the caps are permitted annually based on changes to the CPI for All Urban Consumers.
- The employees in this plan may or may not be covered by Social Security. For employees with service prior to January 1, 2001 covered by Social Security, the final compensation is offset by \$133.33 (or by one-third if, the final compensation is less than \$400). For PEPRA members, the final compensation is not offset.
- The Service Retirement benefit is not capped.

### Vested Deferred Retirement

#### Eligibility for Deferred Status

A CalPERS member becomes eligible for a deferred vested retirement benefit when he or she leaves employment, keeps his or her contribution account balance on deposit with CalPERS, **and** has earned at least 5 years of credited service (total service across all CalPERS employers, and with certain other Retirement Systems with which CalPERS has reciprocity agreements).

#### Eligibility to Start Receiving Benefits

The CalPERS classic member becomes eligible to receive the deferred retirement benefit upon satisfying the eligibility requirements for Deferred Status and upon attainment of age 50. PEPRA Schools members become eligible to receive the deferred retirement benefit upon satisfying the eligibility requirements for Deferred Status and upon attainment of age 52.

#### Benefit

The vested deferred retirement benefit is the same as the Service Retirement benefit, where the benefit factor is based on the member's age at allowance commencement. For members who have earned service with multiple CalPERS employers, the benefit from each employer is calculated separately according to each employer's contract, and then added together for the total allowance.

### Non-Industrial (Non-Job Related) Disability Retirement

#### Eligibility

A CalPERS member is eligible for Non-Industrial Disability Retirement if he or she becomes disabled and has at least 5 years of credited service (total service across all PERS employers, and with certain other Retirement Systems with which PERS has reciprocity agreements). There is no special age requirement. Disabled means the member is unable to perform his or her job because of an illness or injury which is expected to be permanent or to last indefinitely. The illness or injury does not have to be job related. A CalPERS member must be actively working with any CalPERS employer at the time of disability in order to be eligible for this benefit.

#### Benefit

The Non-Industrial Disability Retirement benefit is a monthly allowance equal to 1.8 percent of final compensation, multiplied by *service*, which is determined as follows:

- *service* is CalPERS credited service, for members with less than 10 years of service or greater than 18.518 years of service; or
- *service* is CalPERS credited service plus the additional number of years that the member would have worked until age 60, for members with at least 10 years but not more than 18.518 years of service. The maximum benefit in this case is 33 1/3 percent of Final Compensation.

## Appendix B – Principal Plan Provisions

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### **Non-Industrial (Non-Job Related) Disability Retirement (continued)**

Members who are eligible for a larger service retirement benefit may choose to receive that benefit in lieu of a disability benefit. Members eligible to retire, and who have attained the normal retirement age determined by their service retirement benefit formula, will receive the same dollar amount for disability retirement as that payable for service retirement. For members who have earned service with multiple CalPERS employers, the benefit attributed to each employer is the total disability allowance multiplied by the ratio of service with a particular employer to the total CalPERS service.

## **Post-Retirement Death Benefit**

### **Lump Sum Payment**

Upon the death of a retiree, a one-time lump sum payment of \$2,000 will be made to the retiree's designated survivor(s), or to the retiree's estate.

### **Form of Payment for Retirement Allowance**

Generally, the retirement allowance is paid to the retiree in the form of an annuity for as long as he or she is alive. The retiree may choose to provide for a portion of his or her allowance to be paid to any designated beneficiary after the retiree's death. CalPERS provides for a variety of such benefit options, which the retiree pays for by taking a reduction in his or her retirement allowance. Such reduction takes into account the amount to be provided to the beneficiary and the probable duration of payments (based on the ages of the member and beneficiary) made subsequent to the member's death.

For retirement allowances with respect to service earned by employment in this group, 25 percent of the retirement allowance will automatically be continued to certain statutory beneficiaries upon the death of the retiree, *without* a reduction in the retiree's allowance (50 percent for service not covered by Social Security). This additional benefit is often referred to as post retirement survivor allowance (PRSA) or simply as *survivor continuance*.

In other words, 25 percent of the allowance (or 50 percent for service not covered by Social Security), the *continuance portion*, is paid to the retiree for as long as he or she is alive, and that same amount is continued to the retiree's spouse (or if no eligible spouse, to unmarried children until they attain age 18; or, if no eligible children, to a qualifying dependent parent) for the rest of his or her lifetime. This benefit will not be discontinued in the event the spouse remarries.

The remaining 75 percent of the retirement allowance (or 50 percent for service not covered by Social Security), which may be referred to as the *option portion* of the benefit, is paid to the retiree as an annuity for as long as he or she is alive. Or, the retiree may choose to provide for some of this *option portion* to be paid to **any** designated beneficiary after the retiree's death. Benefit options applicable to the *option portion* are the same as those offered with the standard form. The reduction is calculated in the same manner but is applied only to the *option portion*.

## **Pre-Retirement Death Benefits**

### **Basic Death Benefit**

#### **Eligibility**

An employee's beneficiary (or estate) may receive the Basic Death benefit if the member dies while actively employed. A CalPERS member who is no longer actively employed with **any** CalPERS employer is not eligible for this benefit. A member's survivor who is eligible for any other pre-retirement death benefit described below may choose to receive that death benefit instead of this Basic Death benefit.

#### **Benefit**

The Basic Death Benefit is a lump sum in the amount of the member's accumulated contributions, where interest is currently credited at 7.5 percent per year. In addition, a lump sum in the amount of six months' salary is paid. For purposes of this benefit, one month's salary is defined as the member's average monthly full-time rate of compensation during the 12 months preceding death.

## Appendix B – Principal Plan Provisions

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### 1957 Survivor Benefit

#### Eligibility

An employee's eligible survivor(s) may receive the 1957 Survivor benefit if the member dies while actively employed, has attained at least age 50 for classic members and age 52 for PEPRA school members, and has at least five years of credited service (total service across all CalPERS employers and with certain other Retirement Systems with which CalPERS has reciprocity agreements). A CalPERS member who is no longer actively employed with **any** CalPERS employer is not eligible for this benefit. An eligible survivor means the surviving spouse to whom the member was married at least one year before death or, if there is no eligible spouse, to the member's unmarried children under age 18. A member's survivor may choose this benefit in lieu of the Basic Death benefit or the Special Death benefit.

#### Benefit

The 1957 Survivor benefit is a monthly allowance equal to one-half of the unmodified Service Retirement benefit that the member would have been entitled to receive if the member had retired on the date of his or her death. If the benefit is payable to the spouse, the benefit is discontinued upon the death of the spouse. If the benefit is payable to a dependent child, the benefit will be discontinued upon death or attainment of age 18, unless the child is disabled. There is a guarantee that the total amount paid will at least equal the Basic Death benefit.

#### Cost-of-Living Adjustments

Retirement and survivor allowances are adjusted each year in May for cost of living, beginning the second calendar year after the year of retirement. The standard cost-of-living adjustment (COLA) is 2 percent. Annual adjustments are calculated by first determining the lesser of 1) 2 percent compounded from the end of the year of retirement or 2) actual rate of inflation. The resulting increase is divided by the total increase provided in prior years. For any particular year, the COLA adjustment may be less than 2 percent (when the rate of inflation is low), may be greater than the rate of inflation (when the rate of inflation is low after several years of high inflation) or may even be greater than 2 percent (when inflation is high after several years of low inflation).

#### Purchasing Power Protection Allowance (PPPA)

Retirement and survivor allowances are protected against inflation by PPPA. PPPA benefits are cost-of-living adjustments that are intended to maintain an individual's allowance at 75 percent of the initial allowance at retirement adjusted for inflation since retirement. The PPPA benefit will be coordinated with other cost-of-living adjustments provided under the plan. The total annual outlay for PPPA is limited to 1.1 percent of accumulated member contributions. If this amount of member contributions were insufficient to provide for PPPA payments, the 75 percent target would be proportionately reduced.

#### Employee Contributions

Each employee contributes toward his or her retirement based upon one of the following schedules. The employer may choose to "pick-up" these contributions for the employees.

The contribution schedule is as follows:

The percent contributed below the monthly compensation breakpoint is 0 percent.

The monthly compensation breakpoint is \$0.

The percent contributed above the monthly compensation breakpoint is 7 percent for classic members and 6.5 percent for PEPRA members.

#### Refund of Employee Contributions

If the member's service with the employer ends, and if the member does not satisfy the eligibility conditions for any of the retirement benefits above, the member may elect to receive a refund of his or her employee contributions, which are credited annually with 6 percent interest.

### 1959 Survivor Benefits Program

For these benefits, please refer to the 1959 Survivor Report.

# Appendix C – Participant Data

## Source of the Participant Data

The data was extracted from various databases within CalPERS and placed in a data warehouse by a series of extract programs. Included in this data is:

- Individual member and beneficiary information,
- Employment and payroll information,
- Accumulated contributions with interest,
- Service information,
- Benefit payment information,
- Information about the various organizations which contract with CalPERS, and
- Detailed information about the plan provisions applicable to each group of members.

## Data Validation Test and Adjustments

Once the information is extracted from the various computer systems into the data warehouse, update queries are then run against this data to correct for flaws found in the data. This part of the process is intended to validate the participant data for all CalPERS plans. It is not specific to the Schools pool.

Checks on the data included:

- A reconciliation of the membership of the plans,
- Comparisons of various member statistics (average attained age, average entry age, average salary, etc.) for the plan with those from the prior valuation
- Pension amounts for each retiree and beneficiary receiving payments were compared with the pension amounts from the prior valuation
- Checks for invalid ages and dates, and
- Reasonableness checks on various key data elements such as service and salary.

As a result of the tests on the data, a number of adjustments were determined to be necessary. These included:

- Dates of hire and dates of entry were adjusted where necessary to be consistent with the service fields, the date of birth and each other, and
- The annual earnings rate for most Schools members were overwritten with the annualized earnings based on their yearly contributions.

## Data Statement

The data does not contain information about reciprocal systems and hence salary information for terminated participants covered by reciprocal systems may not be up to date. This situation is not expected to have a material impact on the employer contribution rates since the total present value for all terminated participants represents less than 2 percent of the present value of benefits for all members.

We are unaware of any other data issues that would have a material effect on the results of this valuation.

It is our opinion that, after the adjustments noted above, the participant data was sufficient and reliable for the purposes of the valuation.

## Appendix C - Participant Data

### Reconciliation of Participants

	Active	Transfer	Terminated	Receiving	Total
<b>As of June 30, 2016</b>	<b>307,354</b>	<b>19,313</b>	<b>187,617</b>	<b>218,824</b>	<b>733,108</b>
Retirements	(9,114)	(1,066)	(1,436)	11,576	(40)
Industrial Disabilities	0	(28)	(4)	35	3
Ordinary Disabilities	(146)	(17)	(49)	249	37
Deaths <sup>1</sup>	(426)	(40)	(2,485)	(7,363)	(10,314)
New Survivors	-	-	-	1,319	1,319
Non-Vested Terminations <sup>2</sup>	(13,154)	(702)	13,856	0	0
Vested Terminations	(4,097)	(429)	4,531	(5)	0
Refunds of Contributions	(1,582)	(89)	(2,966)	0	(4,637)
Transfers	(1,272)	2,187	(897)	(18)	0
Redeposits/Rehires	3,758	(369)	(3,337)	(52)	0
First Year in Status	33,800	114	2,377	930	37,221
Data Corrections <sup>3</sup>	2,739	196	351	(5)	3,281
<b>As of June 30, 2017</b>	<b>317,860</b>	<b>19,070</b>	<b>197,558</b>	<b>225,490</b>	<b>759,978</b>

(1) Includes both deaths without survivors and deaths with survivors receiving a benefit

(2) Includes non-vested terminated participants with employee contributions left in the plan.

(3) May include the combining of data records into a single record.

## Appendix C - Participant Data

### Active Members

#### Distribution of Active Members by Age and Service

Attained Age	Years of Service at Valuation Date						Total	Payroll
	0 - 4	5 - 9	10 - 14	15 - 19	20-24	25+		
15 - 24	11,939	19	--	--	--	--	11,958	\$296,621,164
25 - 29	24,989	1,964	64	--	--	--	27,017	813,813,275
30 - 34	20,267	7,010	2,177	69	--	--	29,523	1,089,123,101
35 - 39	16,974	7,492	6,036	1,985	58	--	32,545	1,331,149,785
40 - 44	15,341	7,338	6,511	4,754	1,101	28	35,073	1,485,540,170
45 - 49	15,200	8,726	7,255	5,865	2,662	935	40,643	1,723,674,329
50 - 54	13,167	9,888	9,110	7,429	3,606	3,639	46,839	2,044,398,148
55 - 59	9,939	9,057	9,904	8,501	4,487	5,505	47,393	2,113,749,623
60 - 64	5,300	5,777	6,830	6,462	3,728	4,168	32,265	1,415,720,814
65 and over	2,597	2,915	3,071	2,641	1,576	1,804	14,604	584,159,699
<b>Total</b>	<b>135,713</b>	<b>60,186</b>	<b>50,958</b>	<b>37,706</b>	<b>17,218</b>	<b>16,079</b>	<b>317,860</b>	<b>\$ 12,897,950,108</b>

Counts of members included in the valuation are counts of the records processed by the valuation. Multiple records may exist for those who have service in more than one valuation group. This does not result in double counting of liabilities.

#### Distribution of Average Annual Salaries by Age and Service

Attained Age	Years of Service at Valuation Date						Average Salary
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	
15 - 24	\$24,767	\$48,959	\$0	\$0	\$0	\$0	\$24,805
25 - 29	29,290	40,040	50,893	-	-	-	\$30,122
30 - 34	33,253	42,253	52,667	62,807	-	-	\$36,891
35 - 39	33,550	42,557	52,552	61,096	75,044	-	\$40,902
40 - 44	32,199	41,154	50,921	59,950	64,575	69,408	\$42,356
45 - 49	30,856	38,705	47,974	57,300	63,595	67,928	\$42,410
50 - 54	30,131	35,867	45,047	55,406	61,681	68,315	\$43,647
55 - 59	29,630	34,184	42,961	52,902	59,016	67,148	\$44,600
60 - 64	28,091	32,698	40,793	50,592	55,347	63,835	\$43,878
65 and over	23,434	29,728	39,240	48,461	52,220	58,678	\$40,000
<b>Average</b>	<b>\$30,469</b>	<b>\$37,785</b>	<b>\$46,111</b>	<b>\$54,711</b>	<b>\$59,275</b>	<b>\$65,652</b>	<b>\$40,577</b>

## Appendix C - Participant Data

### Transferred and Terminated Participants

#### Distribution by Age and Service – Transfers to Other CalPERS Plans

Attained Age	Years of Service at Valuation Date						Total	Average Salary
	0 - 4	5 - 9	10 - 14	15 - 19	20-24	25+		
15 - 24	129	0	0	0	0	0	129	\$36,063
25 - 29	869	22	1	--	--	--	892	47,195
30 - 34	1,582	165	15	--	--	--	1,762	56,767
35 - 39	2,125	288	65	9	--	--	2,487	63,808
40 - 44	2,040	365	101	21	1	--	2,528	67,816
45 - 49	2,099	457	137	49	12	1	2,755	68,951
50 - 54	2,081	510	187	77	29	4	2,888	67,754
55 - 59	2,001	524	212	73	25	15	2,850	64,109
60 - 64	1,364	352	111	45	9	8	1,889	58,698
65 and over	674	148	51	12	4	1	890	54,483
<b>Total</b>	<b>14,964</b>	<b>2,831</b>	<b>880</b>	<b>286</b>	<b>80</b>	<b>29</b>	<b>19,070</b>	<b>\$63,168</b>

Counts of members included in the valuation are counts of the records processed by the valuation. Multiple records may exist for those who have service in more than one valuation group. This does not result in double counting of liabilities

#### Distribution by Age and Service – Terminated Participants with Funds on Deposit

Attained Age	Years of Service at Valuation Date						Total	Average Salary
	0 - 4	5 - 9	10 - 14	15 - 19	20-24	25+		
15 - 24	3,291	0	0	0	0	0	3,291	\$28,396
25 - 29	14,542	187	1	--	--	--	14,730	30,053
30 - 34	21,406	1,357	73	1	--	--	22,837	31,665
35 - 39	25,066	2,098	375	22	--	--	27,561	32,060
40 - 44	23,041	2,037	579	72	1	--	25,730	32,506
45 - 49	21,285	2,548	788	105	--	--	24,726	33,222
50 - 54	19,957	3,089	1,132	169	7	6	24,360	33,307
55 - 59	19,915	2,783	809	195	16	2	23,720	31,947
60 - 64	16,084	2,004	534	159	20	1	18,802	31,475
65 and over	10,506	958	253	70	9	5	11,801	30,029
<b>Total</b>	<b>175,093</b>	<b>17,061</b>	<b>4,544</b>	<b>793</b>	<b>53</b>	<b>14</b>	<b>197,558</b>	<b>\$31,970</b>

Counts of members included in the valuation are counts of the records processed by the valuation. Multiple records may exist for those who have service in more than one valuation group. This does not result in double counting of liabilities

## Appendix C - Participant Data

### Retired Members and Beneficiaries

#### Number of Retirees and Beneficiaries - by Age and Retirement Type

Attained Age	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 30	0	0	0	4	1	199	204
30 - 34	--	6	4	--	--	136	146
35 - 39	--	42	13	--	--	182	237
40 - 44	--	110	45	3	--	212	370
45 - 49	--	287	53	13	--	322	675
50 - 54	1,246	822	82	30	1	565	2,746
55 - 59	9,628	1,602	140	110	3	938	12,421
60 - 64	28,664	2,079	178	162	2	1,539	32,624
65 - 74	45,338	2,045	199	193	--	2,449	50,224
70 - 74	38,800	1,791	114	131	3	3,077	43,916
75 - 79	25,958	1,411	61	98	4	3,431	30,963
80 - 84	18,275	826	15	56	3	3,933	23,108
85 and over	20,111	754	16	50	--	6,925	27,856
<b>Total</b>	<b>188,020</b>	<b>11,775</b>	<b>920</b>	<b>850</b>	<b>17</b>	<b>23,908</b>	<b>225,490</b>

Counts of members do not include alternate payees receiving benefits while the member is still working. Multiple records may exist for those who have service in more than one coverage group. This does not result in double counting of liabilities.

#### Annual Allowance Amounts for Retirees and Beneficiaries - by Age and Retirement Type

##### Annual Amounts Including PPPA Payments

Attained Age	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 30	\$0	\$0	\$0	\$25,687	\$4	\$955,579	\$981,270
30 - 34	--	37,612	190	--	--	722,640	760,442
35 - 39	--	431,771	4,007	--	--	1,360,887	1,796,665
40 - 44	--	1,141,995	27,178	31,508	--	1,734,292	2,934,973
45 - 49	--	3,290,812	52,904	101,070	--	2,685,242	6,130,028
50 - 54	10,647,968	9,663,316	99,984	306,902	558	5,145,886	25,864,614
55 - 59	167,332,082	19,586,288	296,060	1,031,394	1,592	9,568,720	197,816,136
60 - 64	570,362,459	25,612,553	364,312	1,571,855	3,328	18,081,418	615,995,925
65 - 69	901,651,786	24,750,210	547,334	1,634,009	--	28,809,654	957,392,993
70 - 74	743,892,618	20,915,991	363,677	1,115,523	4,788	36,763,719	803,056,316
75 - 79	450,481,811	15,572,183	198,556	720,179	2,494	38,619,721	505,594,944
80 - 84	272,576,938	8,108,055	41,283	428,507	2,639	42,433,990	323,591,412
85 and over	248,060,825	6,472,449	114,166	381,814	--	62,211,474	317,240,728
<b>Total</b>	<b>\$3,365,006,487</b>	<b>\$135,583,235</b>	<b>\$2,109,651</b>	<b>\$7,348,448</b>	<b>\$15,403</b>	<b>\$249,093,222</b>	<b>\$3,759,156,446</b>

## Appendix C - Participant Data

### Retired Members and Beneficiaries (continued)

#### Number of Retirees and Beneficiaries - by Years Retired and Retirement Type

Years Retired	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 5 Years	51,289	1,501	184	239	0	8,417	61,630
5 - 9	45,363	1,665	159	234	2	6,020	53,443
10 - 14	36,470	2,065	188	190	2	4,139	43,054
15 - 19	22,960	2,451	149	94	0	2,603	28,257
20 - 24	15,448	2,024	101	36	2	1,429	19,040
25 - 29	9,409	1,122	60	36	4	841	11,472
30 and over	7,081	947	79	21	7	459	8,594
<b>Total</b>	<b>188,020</b>	<b>11,775</b>	<b>920</b>	<b>850</b>	<b>17</b>	<b>23,908</b>	<b>225,490</b>

Counts of members do not include alternate payees receiving benefits while the member is still working. Multiple records may exist for those who have service in more than one coverage group. This does not result in double counting of liabilities.

#### Annual Allowance Amounts for Retirees and Beneficiaries - by Years Retired and Retirement Type

##### Annual Amounts Including PPPA Payments

Years Retired	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 5 Years	\$1,035,784,716	\$19,186,158	\$512,885	\$2,317,620	\$0	\$95,942,721	\$1,153,744,100
5 - 9	911,058,024	21,126,636	496,992	2,123,709	845	64,651,815	999,458,021
10 - 14	679,641,274	26,513,077	554,328	1,556,262	857	42,540,792	750,806,590
15 - 19	377,028,045	28,716,553	261,447	654,636	0	24,099,508	430,760,189
20 - 24	199,548,870	21,753,163	185,134	237,873	6,048	12,210,174	233,941,262
25 - 29	108,738,260	11,362,722	74,029	306,434	4,967	6,540,893	127,027,305
30 and over	53,207,298	6,924,926	24,836	151,914	2,686	3,107,319	63,418,979
<b>Total</b>	<b>\$3,365,006,487</b>	<b>\$135,583,235</b>	<b>\$2,109,651</b>	<b>\$7,348,448</b>	<b>\$15,403</b>	<b>\$249,093,222</b>	<b>\$3,759,156,446</b>

## Appendix C - Participant Data

### Retired Members and Beneficiaries (continued)

#### Number Counts and Benefits - by Year of Retirement

Year Retired	Total Retirements	Total Benefits	Average Benefits
2017*	5,545	\$103,513,465	\$18,668
2016	11,492	243,288,887	21,170
2015	11,498	232,908,174	20,256
2014	10,758	208,391,625	19,371
2013	10,293	190,300,606	18,488
2012	10,539	196,648,906	18,659
2011	10,260	193,649,526	18,874
2010	11,078	219,599,577	19,823
2009	10,179	204,582,000	20,098
2008	8,360	161,367,165	19,302
2007	8,029	149,474,353	18,617
2006	8,315	144,987,658	17,437
2005	8,468	144,922,443	17,114
2004	8,727	151,911,611	17,407
2003	9,117	169,829,336	18,628
2002	7,043	128,359,436	18,225
2001	6,210	110,593,631	17,809
2000	7,760	131,127,349	16,898
1999	4,372	53,948,101	12,339
1998	5,219	66,087,246	12,663
1997	4,841	58,024,116	11,986
1996	4,563	54,961,807	12,045
1995	4,651	56,143,495	12,071
1994	4,145	50,125,911	12,093
1993	4,044	51,281,932	12,681
1992	3,838	47,474,737	12,370
1991	3,441	41,677,933	12,112
1990	2,894	31,329,853	10,826
1989	2,688	28,618,114	10,647
1988	2,403	24,269,150	10,100
1987	2,114	19,749,970	9,342
1986	1,851	16,253,781	8,781
1985 and earlier	10,755	73,754,552	6,858
<b>Total</b>	<b>225,490</b>	<b>\$3,759,156,446</b>	<b>\$16,671</b>

\* The numbers for 2017 are for the first 6 months of the calendar year only

Counts of members do not include alternate payees receiving benefits while the member is still working. Multiple records may exist for those who have service in more than one coverage group. This does not result in double counting of liabilities.

# Appendix D – Normal Cost Information

## Normal Cost Chart

The normal cost is determined using the Entry Age Cost method. Some important features of this method are that the costs are dependent upon a member's entry age in the plan and benefit level of the plan. In general, the lower the entry age the lower the total normal cost. Note that future costs may vary as the entry age of the members change. FAC means Final Average Compensation.

Schools	Total Normal Cost	Employee Contribution <sup>1</sup>	Range of Breakpoints	Average Effective Member Rate	Employer Normal Cost
Schools 2% @ 62 – 3 Year FAC	14.072%	7.0%	--	7.0%	7.072%
Schools 2% @ 55 – 1 Year FAC	16.316%	7.0%	--	7.0%	9.316%

(1) Employee contribution rates are based on rates in effect at the valuation date.

## Development of PEPRA Member Contribution Rates

The table below shows the determination of the Member contribution rate based on 50 percent of the Total Normal Cost on June 30, 2017.

Assembly Bill (AB) 340 created PEPRA that implemented new benefit formulas and a final compensation period as well as new contribution requirements for new employees. In accordance with Section Code 7522.30(b), "new members ... shall have an initial contribution rate of at least 50 percent of the normal cost rate." The normal cost for the plan is dependent on the benefit levels, actuarial assumptions and demographics of the plan particularly the entry age into the plan. Should the total normal cost of the plan change by one percent or more from the base total normal cost established for the plan, the new member rate shall be 50 percent of the new normal cost rounded to the nearest quarter percent.

Plan	Basis for Current Rate		Effective July 1, 2018			
	Total Normal Cost <sup>1</sup>	Member Rate	Total Normal Cost <sup>2</sup>	Change	Change Needed	Member Rate
Schools	12.912%	6.5%	14.072%	1.160%	Yes	7.0%

(1) As of June 30, 2016 valuation date

(2) As of June 30, 2017 valuation date

# Appendix E – Glossary of Actuarial Terms

**Accrued Liability:** (also called Actuarial Accrued Liability or Entry Age Normal Accrued Liability) The total dollars needed as of the valuation date to fund all benefits earned in the past for *current* members.

**Actuarial Assumptions:** Assumptions made about certain events that will affect pension costs. Assumptions generally can be broken down into two categories: demographic and economic. Demographic assumptions include such things as mortality, disability and retirement rates. Economic assumptions include discount rate, salary growth and inflation.

**Actuarial Methods:** Procedures employed by actuaries to achieve certain funding goals of a pension plan. Actuarial methods include funding method, setting the length of time to fund the Accrued Liability and determining the Value of Assets.

**Actuarial Valuation:** The determination, as of a valuation date of the Normal Cost, Accrued liability, and related actuarial present values for a pension plan. These valuations are performed annually or when an employer is contemplating a change to their plan provisions.

**Amortization Bases:** Separate payment schedules for different portions of the Unfunded Liability. The total Unfunded Liability of a plan can be segregated by "cause," creating "bases" and each such base will be separately amortized and paid for over a specific period of time. However, all bases are amortized using investment and payroll assumptions from the current valuation. This can be likened to a home having a first mortgage of 24 years remaining payments and a second mortgage that has 10 years remaining payments. Each base or each mortgage note has its own terms (payment period, principal, etc.)

Generally, in an actuarial valuation, the separate bases consist of changes in unfunded liability due to contract amendments, actuarial assumption changes, actuarial methodology changes, and/or gains and losses. Amortization methodology is determined by Board policy.

**Amortization Period:** The number of years required to pay off an Amortization Base.

**Classic Member (under PEPR):** A classic member is a member who joined CalPERS prior to January 1, 2013 and who is not defined as a new member under PEPR. (See definition of new member below)

**Discount Rate Assumption:** The actuarial assumption that was called "investment return" in earlier CalPERS reports or "actuarial interest rate" in Section 20014 of the California Public Employees' Retirement Law (PERL).

**Entry Age:** The earliest age at which a plan member begins to accrue benefits under a defined benefit pension Plan or risk pool. In most cases, this is the same as the date of hire.

(The assumed retirement age less the entry age is the amount of time required to fund a member's total benefit. Generally, the older a member is at hire, the greater the entry age normal cost. This is mainly because there is less time to earn investment income to fund the future benefits.)

## Appendix E – Glossary of Actuarial Terms

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**Entry Age Normal Cost Method:** An actuarial cost method designed to fund a member's total plan benefit over the course of his or her career. This method is designed to yield a rate expressed as a level percentage of payroll.

(The assumed retirement age less the entry age is the amount of time required to fund a member's total benefit. Generally, the older a member on the date of hire, the greater the entry age normal cost. This is mainly because there is less time to earn investment income to fund the future benefits.)

**Fresh Start:** A Fresh Start is when multiple amortization bases are collapsed to one base and amortized together over a new funding period.

**Funded Status:** A measure of how well funded, or how "on track" a plan or risk pool is with respect to assets versus accrued liabilities. A ratio greater than 100% means the plan or risk pool has more assets than liabilities and a ratio less than 100% means liabilities are greater than assets.

**GASB 68:** Statement No. 68 of the Governmental Accounting Standards Board. The accounting standard governing a state or local governmental employer's accounting and financial reporting for pensions. GASB 68 replaces GASB 27 effective the first fiscal year beginning after June 15, 2014.

**New Member (under PEPR):** A new member includes an individual who becomes a member of a public retirement system for the first time on or after January 1, 2013, and who was not a member of another public retirement system prior to that date, and who is not subject to reciprocity with another public retirement system.

**Normal Cost:** The annual cost of service accrual for the upcoming fiscal year for active employees. The normal cost should be viewed as the long-term contribution rate.

**Pension Actuary:** A business professional that is authorized by the Society of Actuaries, and the American Academy of Actuaries to perform the calculations necessary to properly fund a pension plan.

**PEPR):** The California Public Employees' Pension Reform Act of 2013

**Present Value of Benefits (PVB):** The total dollars needed as of the valuation date to fund all benefits earned in the past or expected to be earned in the future for *current* members.

**Unfunded Liability (UAL):** When a plan or pool's Value of Assets is less than its Accrued Liability, the difference is the plan or pool's Unfunded Liability. If the Unfunded Liability is positive, the plan or pool will have to pay contributions exceeding the Normal Cost.



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